



UNITED STATES NAVY

# MEDICAL NEWS LETTER

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Change of Address

Please forward changes of address for the News Letter to: Commanding Officer, U. S. Naval Medical School, National Naval Medical Center, Bethesda 14, Md., giving full name, rank, corps, and old and new addresses.

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The issuance of this publication approved by the Secretary of the Navy on 28 June 1961.

Cholera - Physiological Alterations  
and Their Correction

CDR Raymond H. Watten MC USN\*, and CAPT Robert A. Phillips MC USN. From the U.S. Naval Medical Research Unit No. 2 (NAMRU-2), Lecture and Review Series 60-2, January 1961; Box 14, APO 63, San Francisco, Calif. This study was supported in part by funding under Public Law 480, Section 104 (c).

Physiologic studies of the effects of water and electrolyte losses from severe diarrhea have been of interest primarily to the pediatrician. Adult diarrheal diseases in the Western World are rarely severe enough to be of consequence. Cholera, an ancient diarrheal disease, affects adults and children, producing catastrophic loss of body water and electrolytes which causes death, if untreated, to 60% of its victims. Despite the high mortality rate and frequency of this entity in Asian countries, modern research technics have seldom been employed to further the understanding of the physiologic defects resulting from massive transfers of water and electrolytes out of the body.

Although cholera continues to be a problem of considerable magnitude in Asia, it is questionable if epidemics of major consequence will again occur in the Western Hemisphere while adequate safeguards are maintained. Why, then, should the clinical aspects of this disease be of interest to Western physicians? One reason is that the cholera patient represents an ideal model for the study of the effects of dehydration, shock, and electrolyte losses which have immediate application in understanding similar phenomena that occur in metabolic disorders, burns, and other illnesses involving water and electrolyte depletion. In addition, there has been increased interest in gastrointestinal physiology during the past decade, and observations from the study of cholera patients can be applied to newer concepts of water and electrolyte exchange in the bowel derived from experimental procedures. Most important, a rational plan for the treatment of cholera, based on modern concepts of water and electrolyte metabolism, has been formulated using data from studies of cholera patients (1).

Information in this paper is the result of studies of over 50 patients with varying degrees of diarrhea during cholera epidemics in Bangkok, Thailand, by NAMRU-2 during the past three years (2). This work has been a continuation of similar studies during the 1948 cholera epidemic by NAMRU-3 in Cairo, Egypt (3, 4).

The acute fulminating diarrhea of cholera will cause severe dehydration, shock, acidosis, and potassium depletion within a few hours. Shock and hemoconcentration will produce suppression of urine and, if severe, anoxic renal tubular damage may occur. Death in the early stage of cholera is usually the result of vascular collapse, therefore, adequate fluid replacement is of utmost urgency. Delayed deaths usually result from acute renal insufficiency

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and uremia as a consequence of delayed or inadequate treatment.

Over 50 years ago, Leonard Rogers, in India, advocated the use of slightly hypertonic saline solutions for the correction of water and electrolyte losses in cholera (5). This recommendation was based on the observation that the blood of acute cholera patients contained less chloride than that of healthy controls. Despite the fact that these studies employed technics far from satisfactory by modern standards, hypertonic saline solutions continue to be the treatment of choice in many areas where cholera is endemic. About the same time, Sellards, in the Philippines, recognized the fact that cholera patients were severely acidotic (6). His recommendations led to the generally accepted practice of adding sodium bicarbonate to treatment solutions. At that time it was thought that the addition of bicarbonate not only hastened recovery but prevented the development of uremia.

Studies conducted by NAMRU-2 during the 1958 Bangkok cholera epidemic delineated the magnitude of water and electrolyte losses in acute cholera, using balance technics with frequent measurements of intake and output and simultaneous determinations of electrolyte concentrations in blood, urine, and feces (2). It was found that the volume of diarrhea varied from 1 to 17 liters in a 24-hour period, depending upon the severity of the disease. It was observed that fecal electrolyte concentrations varied with the hourly stool volume (Table 1, page 5). If diarrhea occurred at a rate of 125 ml or more per minute, the concentrations of sodium and chloride were nearly isotonic with plasma, while potassium and bicarbonate levels were significantly higher. As hourly fecal volume decreased, the concentrations of sodium and chloride decreased while the concentration of potassium rose even higher. These observations are in accord with experimental studies in which sodium and chloride were preferentially reabsorbed from the intestine in exchange for potassium and bicarbonate (7, 8). The significance of this observation is, while large volumes of diarrheal stool in cholera can produce severe imbalances, smaller fecal volumes may produce similarly severe losses of electrolyte.

For many years the anatomical defect responsible for the voluminous diarrhea of cholera was thought to involve desquamation of the intestinal mucosa by a toxic substance elaborated by the Vibrio comma (9). This concept has been abandoned due to the work of Dr. Gangarosa and his associates who used a Crosby capsule to demonstrate that the ileal and duodenal mucosa in cholera patients remained intact during all phases of the disease (10). The specific mechanism responsible for the diarrhea of cholera is still unknown. It is known that there is a continuous and dynamic flux of water and electrolytes in and out of all levels of the gastrointestinal tract. In normal man, the magnitude of these exchanges is not apparent due to the efficient reabsorption of water and salts in the lower ileum and large intestine. Diarrhea results when the resorptive capacity of these segments is either impaired by damage to the mucosal cells, overtaxed by a large volume of intestinal contents from above, or a combination of both of these circumstances.

Alterations in the permeability of the intestinal cell membrane by the Vibrio or its toxic products could alter the absorptive capacity of the various

segments of the bowel sufficiently to produce diarrhea such as is seen in acute cholera. We have postulated that a 35% reduction in the absorptive capacity of the intestine will result in fecal volumes in the range of the 17 liters in 24 hours actually measured in two of our patients (2).

The physiologic effects produced by the profuse diarrhea of cholera, then, are related to the loss of body water and electrolytes. These losses result in hemoconcentration, shock, impaired renal function, plasma hypertonicity, acidosis, and the various manifestations of severe and sudden potassium depletion. Treatment should begin with correction of the depleted extracellular fluid volume.

**Table 1**  
**Twenty-four hour intake and output and fecal electrolyte concentrations**  
**in cholera patients with (A) over 3 liters fecal excreta and (B) under 3 liters**

Patient	Sex	Age	Weight Kg	I. V. fluids Volume	Urine Volume	Fecal Volume	Fecal electrolyte contents				
							Na	Cl	K m Eq/L	CO <sub>2</sub>	Osmolarity mOsm/L
A											
1	M	28	65	10,200	1,425	3,465	130	68	33.3		337
2	M	83	45	18,100	305	11,430	165	107	9.5		328
3	M	30	43	12,100	1,795	6,750	142	109	15.6		291
5	F	15	36	6,700	1,005	3,125	152	123	13.6		307
6	F	30	35	19,400	210	7,700	135	130	14.8		311
8	M	38	55	13,250	360	8,320	139	107	16.5		324
10	F	23	34	10,700	1,650	5,650	119	104	16.7	46.3	259
12	F	23	40	10,500	1,480	7,260	132	113	14.3		297
14	M	58	58	13,000	855	10,000	129	93	16.0	51.4	279
15	M	34	55	21,000	1,175	17,435	142	118	9.7	42.7	279
21§	M	23	52	12,880	1,665	8,240	122	100	17.3	40.2	282
Mean				13,200	1,085	8,125	137	107	16.1	45.2	300
B											
7*	F	83	30	9,220	930	2,885	139	121	16.2		288
9	F	46	42	9,600	1,690	2,870	131	105	24.9		273
20§	M	57	37	11,200	2,630	2,700	123	114	27.8	31.7	285
23§	M	22	52	6,000	1,335	880	82	58	40.0	60.5	232
24§	M	23	39	4,700	3,030	1,870	122	78	23.9	45.9	266
25§	F	35	50	3,500	545	2,860	85	60	25.7	35.7	254
Mean				7,370	1,700	2,345	114	89	26.4	43.5	266

\* Died

§ Treated with non-electrolyte intravenous solutions as well as with normal saline

Severe degrees of dehydration cannot be assessed by clinical means. Loss of skin turgor, dry tongue, and other physical signs are sufficient to indicate that dehydration exists, but unfortunately give no index of its severity. Data from our studies during epidemics in Thailand also indicate that electrolyte determinations are of little value in assessing the extent of water loss. Hemoconcentration should represent one method of measuring the degree of dehydration, but the frequency of anemia in peoples subject to cholera renders

determinations of hemoglobin or packed cell volume entirely inaccurate. One extremely accurate method which has found general acceptance is the determination of blood or plasma specific gravity, using the copper-sulphate method (11). Ease of preparation of the test solutions and simplicity of their use facilitate the employment of this method under even the most difficult conditions. All that is required are copper-sulphate solutions of varying specific gravity and a method for separating the plasma from the whole blood.

Using this method during the Egyptian cholera epidemic of 1948, U.S. Naval investigators found that for each .001 increase in specific gravity of the whole blood, 400 ml of saline should be given for correction of the dehydration (3). For plasma specific gravity, 200 ml of saline was required for each .001 increase in specific gravity. These values are for an average 50-kilogram man and adjustments on the basis of weight may be made for children and infants.

The treatment of acute cholera requires the immediate replacement of water and electrolytes. On admission, a patient may be near death from shock and immediate vigorous treatment is absolutely necessary. Using a large needle, a blood sample for specific gravity analysis may be obtained and intravenous fluids started through the same needle. The rate of administration of saline should be as rapid as possible, at least 100 ml per minute should be given as patients with severe dehydration may require 4 to 5 liters of saline to establish normal plasma volume. During the phase of initial rehydration, the fluid of choice is normal saline. Restoration of fluid volume at this stage is the most important objective to be accomplished. After rehydration has been established, saline is continued at a rate which will insure replacement of stool and urinary water lost during the subsequent course of the disease as well as to cover insensible loss of water. These insensible losses may be considerable as, in areas of high ambient temperature and humidity, cholera patients may lose as much as 1.5 ml of water per kilogram per hour (12).

Following hydration, attention should be given to the correction of acidosis. The acidosis of cholera is generally not severe, but its correction will result in general improvement of the patient's over-all condition and outlook. Patients not treated for acidosis generally remained apathetic and semi-stuporous. Convalescence appeared to be prolonged. As a general rule, 0.5 mEq of sodium bicarbonate per kilogram of body weight should be infused for each 1.0 mEq depression of plasma  $\text{CO}_2$  content (2).

Potassium replacement in cholera has generally been ignored. It is interesting that Leonard Rogers, in 1911, (5) advised using 5 mEq of potassium chloride in his hypertonic replacement solution, but several years later abandoned its use because he felt it might be dangerous (13). The excessive loss of potassium in cholera stools was documented in 1954 by investigators in India (14), but there have been no reports of its therapeutic uses in acute cholera. Losses of potassium in the feces and urine of a cholera patient may result in a 15 to 30% decrease of the total body potassium (15). Such losses, if not corrected, may result in derangement or damage to several vital organs. Cardiac abnormalities were noted during our studies in several patients in

whom potassium was deliberately withheld during treatment. Figure 1 shows electrocardiographic tracings taken on admission, after rehydration, after correction of acidosis, and following potassium administration. T-wave changes are evident in all leads and did not return to normal until potassium had been given. Large losses of potassium may result in myocardial dysfunction and may be responsible for death due to heart failure reported during convalescence from this disease (16).

Renal damage is an important complication of potassium depletion. A current study in Thailand during the recent epidemics indicates that hypokalemic changes in the renal tubule cells are found in patients dying in uremic

Figure 1

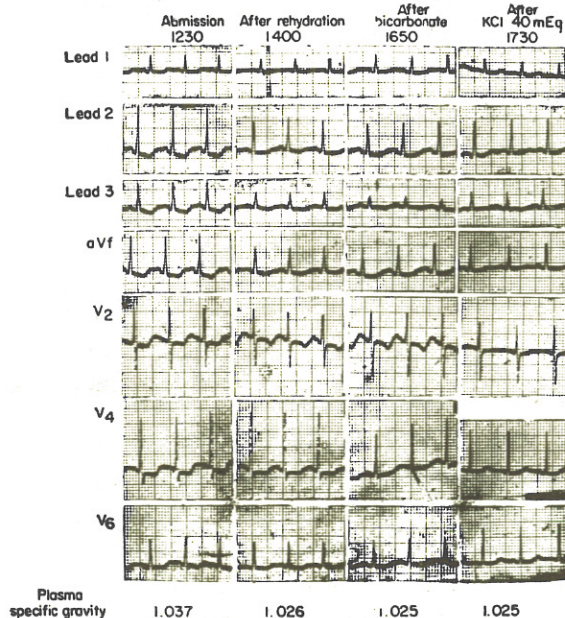
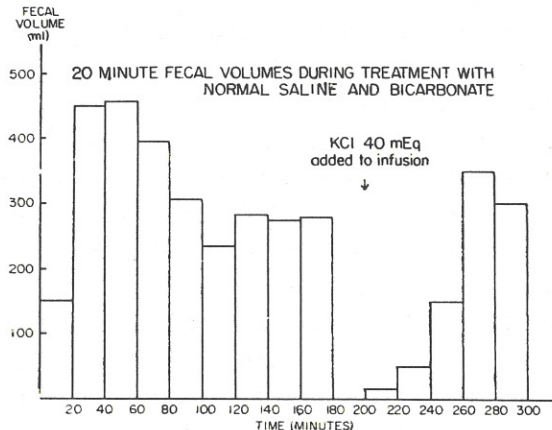


Figure 2



is given (18). The effect of potassium depletion on renal function in patients with acute cholera, who may have already suffered anoxic damage to renal tubular architecture, may account for the frequency of acute renal insufficiency in this disease.

Neuromuscular disturbances have been reported following acute cholera and these may be related to marked intracellular electrolyte derangements following excessive potassium loss (19). Experimental studies of chronic potassium depletion in man and animals have indicated that sodium will replace potassium in the cell, producing an intracellular acidosis and plasma alkalosis. This so-called hypokalemic alkalosis was seen in our cholera patients and in some instances persisted for several weeks.

Paralytic ileus is another manifestation of potassium depletion. Fig. 2 shows 20-minute fecal volumes in a patient with severe cholera who was being

treated with normal saline and bicarbonate. The volume of feces dropped to zero at 180 minutes, then increased following the infusion of 40 mEq of potassium chloride.

Because of the dangers of potassium depletion, its replacement should start as soon as rehydration is accomplished. Caution in the use of potassium should be observed if the patient has impaired renal function; but during the acute phase of the disease while diarrhea continues, it may be given with impunity as it will be lost in the stool in concentrations sufficient to prevent complications. During convalescence, potassium solutions may be given by mouth if renal function is satisfactory.

It would be ideal to have available a single replacement solution that would replace all fluid and electrolyte losses from a cholera patient. Such a solution would have to be slightly hypotonic and contain adequate amounts of bicarbonate, potassium, and sodium chloride to cover the loss of these ions.

One theoretical disadvantage with such a solution would be the possibility of acute hyperkalemia during the initial hydration period when large volumes of solution are being rapidly administered. Dehydrated and acidotic patients have a greater tolerance for potassium infusions than normal subjects and we have given 1.0 mEq of potassium per minute to such patients without untoward effect. Until further experience with these solutions has been obtained, it would be preferable to delay potassium repletion until rehydration has been accomplished. Then potassium in amounts of 10 mEq or more may be added to each liter of replacement solution.

Adjuncts to therapy such as plasma, plasma volume expander, cardiac stimulants, vasopressor agents, antibiotics, and bacteriophage are mentioned only to be condemned as none of these have any place in the treatment of cholera. A consideration of the physiologic abnormalities produced by the diarrhea of cholera indicates that the principal defects are due solely to loss of water and electrolytes from the body. Replacement of these substances will restore the blood volume, bring the blood pressure to normal and, if anoxic renal damage has not already occurred, reestablish urinary function. It must be stressed that the continued administration of intravenous fluid and electrolytes is necessary until the diarrhea ceases.

The maintenance of hydration in an acute cholera patient may be gauged by several means. The most accurate method is the measurement of plasma specific gravity at frequent intervals. In epidemic situations or in areas where even minimal laboratory facilities are not available, careful observation of the timed fecal volume serves as an adequate guide to fluid loss. Urine output is another practical method of following the effectiveness of hydration. A urinary output of 60 to 100 ml per hour indicates adequate rehydration if renal function is not impaired. Blood pressure and the general appearance of the patient are not reliable guides to therapy as dangerous levels of dehydration may exist despite normal blood pressure in a patient who appears relatively comfortable.

Summary. Physiologic principles should be the cornerstone to rational and scientific treatment of cholera. It is believed that adherence to these

principles will result in a further reduction in mortality from this disease which continues to kill thousands of people every year.

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NOTE: Much of the material presented in this article would be applicable to the therapy of other severe acute diarrheal diseases, such as the bacillary and amoebic dysenteries. This could be especially important when the clinical management includes treatment specific for the disease in question. The uninitiated tend to underestimate the life-saving importance of the principles which are so well described by Dr. Phillips, Dr. Watten, and their co-workers on the staff of NAMRU-2.—Editor

### New Light on Genetic Code for Proteins

Public Health Rep: 77: 210, PHS DHEW, March 1962.

Partial deciphering of the genetic code, a system of messages between two chemicals that are instrumental in the origin and continuity of life, has been accomplished by Public Health Service scientists. Dr. Marshall W. Nirenberg and Dr. J. Heinrich Matthaei of the National Institute of Arthritis and Metabolic Diseases have prepared a biochemical system that is patterned after the genetic code and that can be directed to manufacture specific proteins.

Introduction of known message-carrying chemical substances into the system to direct the production of certain protein molecules represents a partial cracking of the message code of heredity which is specific for each type of living cell. The work has important implications for studies of protein synthesis and genetic problems.

The genetic code involves the hereditary materials, DNA (desoxyribonucleic acid) and RNA (ribonucleic acid), present in all living cells. DNA is composed of sugars and phosphoric acid groups to which are attached four chemical bases. Its ability to transmit genetic information from one generation to the next derives from its four bases which make up a template, or mold. This template of hereditary specifications is transferred by RNA which, in turn, directs the manufacture of protein.

RNA's role as messenger is dependent on its own bases—adenine, guanine, cytosine, and uracil. The sequence of these four bases determines how some 20 different amino acids will be linked to form specific protein molecules. A major step toward breaking the code by which varying positions of the bases direct the selection of amino acids has been taken by the NIAMD scientists, who added synthetic RNA to a protein-synthesizing system and produced certain proteins.

Nirenberg and Matthaei prepared the system from extracts of Escherichia coli. The addition of certain samples of synthetic RNA caused the system to produce protein material incorporating only certain amino acids. For example, when polyuridylic acid, a synthetic RNA containing only uracil, was added, one particular amino acid, phenylalanine was incorporated into the protein material. Thus, it is possible to relate RNA samples of certain structures to specific amino acids.

This work was reported in the October 1961 and subsequent issues of Proceedings of the National Academy of Sciences.

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### Untreated Hypertension

Raymond D. Pruitt, Houston, Texas. Southern Med J 54: 378-387, April 1961. Reviewed in Ohio Med J 58: 302, March 1962.

In this review of untreated hypertension, emphasis has been placed on the following features of this disease. Primary or essential hypertension is a

disease which begins almost exclusively during youth and early middle age. After the hypertensive state is established, the victim survives an average period of 20 years, during the first two-thirds of which time he is asymptomatic. A course of benign and uncomplicated nature for 10 years implies a favorable prognosis, whereas progressive increase in pressure during a short period is likely to initiate a malignant or accelerated form of the disease which, if not interrupted by effective treatment, will kill in haste.

Death in malignant or accelerated hypertension commonly is an expression of arteriolar damage leading to, or attended by, renal insufficiency progressing to the uremic state. Death in essential hypertension results from atherosclerotic disease. Evidence—clinical, pathologic, and experimental—indicates acceleration of atherosclerotic disease by hypertension. The two processes, hypertension and atherosclerosis, would appear each to aggravate the other, but to arise from independent predispositions or sources.

Unquestionably, therapeutic measures which reduce blood pressure influence favorably the prognosis in malignant or accelerated hypertension where arteriolar lesions are the common and direct cause of death. The influence of therapy on the survival of patients with benign hypertension is not established, death resulting commonly from the effects of atherosclerotic lesions related only in secondary fashion to the high blood pressure.

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#### Achalasia in Children as a Cause of Recurrent Pulmonary Disease

E. H. Schultz Jr MD\*, Department of Radiology, University of Florida  
College of Medicine, Gainesville, Fla. J Pediat 59: 522-528, October '61.

The clinical problem of recurrent, nonspecific pulmonary infections in children often leads to a search for an underlying systemic disorder, such as cystic fibrosis, agammaglobulinemia, or familial dysautonomia. Bronchoscopy and bronchography may be undertaken to determine possible structural abnormality. The sinuses and tonsils are viewed with suspicion.

The author reports two cases of achalasia of the esophagus associated with chronic respiratory problems in children. Achalasia is not a rare disorder in adults, but it is seldom considered in pediatric patients. In children the recurrent respiratory symptoms due to aspiration often overshadow any dysphagia, and the child may not complain at all of the latter.

In the author's first case, dilatation of the distal esophagus was performed several times with the use of a Mosher bag. Although symptoms occasionally recurred, they were less severe and the child was considerably improved during the next three and one-half years. Occasional recurrences of dysphagia and night cough were promptly relieved by dilatations. The esophagus returned toward a more normal size.

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In the second case, esophagoscopy and a Heller myotomy were performed under general anesthesia; the mucosa appeared normal at the area of esophageal narrowing without evidence of chronic inflammation. Longitudinal incision of the distal esophagus and gastric fundus, down to the mucosa, was done. The child was discharged 7 days later after an uncomplicated convalescence. At the last clinic visit, 17 months later, there had been no recurrence of fever, nausea, regurgitation, or difficulty with eating. Radiologic examination of the esophagus at this time revealed prompt passage of barium through the esophagus in upright position. In supine position emptying of the esophagus occurred slowly, but there was no local point of obstruction. No coordinated peristaltic activity was evident, although intermittent contractions occurred. The esophagus remained slightly dilated.

In patients with achalasia, there is partial and apparently functional obstruction to emptying of the esophagus, centered near the esophagogastric junction. Early in the disease, the esophagus dilates only slightly and hypertrophy of circular muscle fibers occurs, preventing retention of contents in the esophagus. With continued obstruction, the esophagus becomes progressively dilated. On X-ray examination and at postmortem there is regularly seen a short undilated segment, 2 to 4 cm in length, in the most distal portion of the esophagus.

In adults, after many years of symptoms, the esophagus degenerates to a markedly distended, elongated, and tortuous tube, continuously retaining a liter or more of food and secretions. In children, the esophagus usually has been found to be only moderately dilated. This is consistent with the shorter duration of the disease.

Microscopic examination reveals degeneration, necrosis, and fibrotic replacement of nerve ganglion cells in the myenteric plexus of the esophagus. First emphasized by Hurst and Rake, this pathologic basis for the physiologic disturbance has been confirmed by most subsequent investigators. The reduction of ganglion cells is most marked in the distal esophagus, including the undilated segment. There is no fibrosis or stricture in the undilated segment. While some muscular hypertrophy may be found, it will also then be present in the dilated portion of the esophagus. Sections taken just below the undilated segment show normal numbers of ganglion cells.

Freezing or injecting phenic acid into the distal esophagus in animals produced degeneration and necrosis of ganglion cells with reproduction of the radiologic and postmortem appearance of achalasia.

Studies of intraluminal pressures in the distal esophagus in response to drugs have shown responses characteristic of denervated intestine in patients with achalasia. Such response has not been obtained in patients with esophageal obstruction caused by strictures or tumors.

Evidence indicates that the disease is due to disorganization and perhaps ablation of effective parasympathetic stimuli to the distal esophagus, with failure of relaxation (achalasia) of the segment of normal high tone near the esophagogastric junction. There is little evidence to support the older theory of primary spastic contracture at this level (cardiospasm), although the terms are often used interchangeably.

Symptomatic achalasia is usually encountered in adults. Of 691 consecutive cases of achalasia reported from the Mayo Clinic, 5% of patients had symptoms which began before the age of 14 years. A later, similarly large series showed an incidence of 3% with symptoms starting in the first decade of life.

Several instances of recurrent vomiting in the immediate postnatal period have been reported as cases of "cardiospasm." The diagnosis is based on radiologic demonstration of a slightly dilated esophagus and the presence of contrast medium in the esophagus for several hours. These infants were all relieved by a few days of gastric intubation or by the administration of atropine, and had no further difficulty.

In older children the insidious onset of dysphagia is probably the most common presenting symptom. A sensation of substernal discomfort or actual pain may occur in adults, but is rarely mentioned in the reported cases in children. Occasionally, the child feels a sense of obstruction in the throat with the result that tonsillectomy is performed for relief.

A number of case reports emphasize that these children may appear at first to present problems of chronic lung disease with cough, sputum production, and recurrent episodes of pneumonia. Bronchiectasis has been frequently mentioned as the first clinical impression in these cases and, indeed, it occurs in untreated cases. Belcher reviewed the clinical features of six teenage patients with achalasia and significant chronic pulmonary disease; chronic cough was the chief complaint in five children, and dysphagia was a prominent symptom in only one.

All patients with achalasia are potential candidates for pulmonary disease; significant involvement is present in about 10% of adults with achalasia. A large series of consecutive cases of achalasia in children has not been reported, but from various case reports the incidence of pulmonary involvement would seem greater than in adults.

Since the fluid level in the dilated esophagus does not reach the level of the glottis in the erect position, overflow and aspiration probably occur primarily during sleep. Nocturnal regurgitation, recurrent cough, and episodes of pneumonia are prominent in the history. Areas of chronic pulmonary infiltration and fibrosis are the most common radiologic finding in the cases with pulmonary disease, but bronchiectasis, lung abscess, and lobar atelectasis occur. Sudden death by aspiration of esophageal contents while bending over has been reported.

It is of interest that nonpathogenic, acid-fast, apparently saprophytic bacilli can be recovered from the sputum or gastric washings from a number of patients with achalasia and pulmonary complications. The possibility of confusion of the chronic pulmonary manifestations with tuberculosis is evident. Indeed, the recurrent aspiration of milk fats floating at the top of the esophageal contents probably enhances survival and proliferation of mycobacteria, allowing saprophytic strains to become actively pathogenic.

The diagnosis of achalasia is based on radiologic demonstration of the characteristic anatomic and physiologic disturbances of the esophagus.

On plain films of the chest, the wide, fluid-filled esophagus sometimes can be seen in the posterior mediastinum. Indeed, one child with achalasia was treated with X-ray therapy for a posterior mediastinal "mass" before the correct diagnosis was made. An air-fluid level often is evident high in the posterior mediastinum. The air bubble in the stomach, almost always seen in normal children because of air swallowing, is often absent.

In children, barium study usually reveals the esophagus to be moderately dilated. The ingested barium mixes with variable amounts of retained secretions in the esophagus. The tapered narrowing of the esophagus at the level of the diaphragm, as well as the long delay before any barium enters the stomach, can be demonstrated. After ingestion of barium, the esophagus may show some random contractions, but a self-propelling, normal peristaltic wave is not seen.

Differentiation must be made from organic stricture of the distal esophagus for which fluoroscopic observation is essential. In patients with stricture, normal or hyperactive peristaltic waves usually can be detected passing the entire length of the thoracic esophagus. After inhalation of amyl nitrite, the caliber of the tapered narrowing will increase in patients with achalasia, allowing a variable quantity of contrast medium to enter the stomach. The caliber of an organic stricture will be unaffected by this procedure.

Children with partial obstruction of the esophagus may fail to express their sensation of dysphagia, and younger children may accept it as normal. In children with recurrent pulmonary infections of obscure origin, barium study of the esophagus is a simple procedure which may disclose a localized anatomic abnormality amenable to surgical correction. Certainly, a barium swallow should precede bronchoscopy or other surgical diagnostic procedure.

Since nonpathogenic acid-fast bacilli have been recovered from many children with achalasia, study of the esophagus with barium would seem reasonable in any child from whom acid-fast bacilli are recovered in the presence of a negative skin test for tuberculosis.

Both achalasia of the esophagus and Hirschsprung's disease of the large bowel are secondary to loss of ganglion cells in a portion of their walls. The defect is congenital in megacolon; in contrast, the histologic studies from patients with achalasia suggest an inflammatory or degenerative process replacing ganglion cells previously present. This correlates with the usual clinical onset of achalasia in adulthood.

The disorder that has been reported as "cardiospasm" in the neonatal period apparently does not represent the same pathologic condition as achalasia in older children and adults, since prompt recovery usually occurs within a few days. On barium study, the esophagus of normal infants often is wide in relation to the chest when compared to standards in adults, and in infants in the supine position, emptying into the stomach is normally delayed for variable periods.

Achalasia represents one of the more easily remediable causes of chronic respiratory disorders in children.

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## MISCELLANY

### American Board of Obstetrics and Gynecology

Office of the Secretary

Robert L. Faulkner M. D.  
2105 Adelbert Road  
Cleveland 6, Ohio

Applications for certification in the American Board of Obstetrics and Gynecology, new and reopened, for the 1963 Part I Examinations are now being accepted. Candidates are urged to make application at the earliest possible date. The deadline date for receipt of applications is July the first, 1962.

All applicants and candidates for reexamination are required to submit with their application or letter of request, a duplicate list of their hospital dismissals for the preceding twelve months, made up in accordance with the revised format shown on the last page of the current Bulletin.

Current Bulletins outlining present requirements may be obtained by writing to the Secretary's office.

Diplomates of this Board are requested to inform the Office of the Executive Secretary of any change in address. Your cooperation will be appreciated. (Training Branch, Professional Division, BuMed)

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### Addendum and Erratum Notices

In reference to USN Medical News Letter, Vol. 39, No. 6, of 23 March 1962:

- (a) On page 13, under "Serum Nitrogenous Constituents," Uric Acid 2.4 - 5.9 mg/100 mls should be added to the list.
- (b) On page 14, under "Cerebro-Spinal Fluid," the Chloride should be expressed as 119 - 128 mEq/L instead of 119 - 128 mg/100 ml. The cerebro-spinal fluid chloride is 680 - 750 when expressed as milligrams percent or mg/100 ml.

Appreciation is extended to CAPT John Shaver MC USN, C. O., Naval Medical School for notice (a), and to RADM William M. Silliphant MC USN (Ret), School

of Medicine, Cancer Research Institute, University of California San Francisco Medical Center, for notice (b). As most of our Medical News Letter readers know, ADM Silliphant was Deputy Director of Armed Forces Institute of Pathology from 1952 to 1955, and Director, AFIP, for four years, 1955 to 1959 when he retired after more than twenty-nine years of service in the Medical Corps of the U. S. Navy. Both he and CAPT Shaver and other outstanding Pathologists of the Navy have been staunch advocates of strong Residency Training Programs in Pathology in our hospitals. For years, these have provided for equal allocation of training schedules to Clinical Pathology and Anatomic Pathology for Pathology Residency Training. The American Board of Pathology examines and certifies separately in these two components of the broad field of Pathology. —Editor

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Postgraduate Short Courses for Medical Corps, Dental Corps, Nurse Corps, and Medical Service Corps Officers Sponsored by the Department of the Army during Fiscal Year 1963

The following postgraduate professional short courses will be conducted by the Army Medical Service during Fiscal Year 1963. Eligible Medical Corps, Dental Corps and Nurse Corps officers, are those who meet the criteria prescribed by BUMED INSTRUCTION 1520.8; Manual of the Medical Department 6-130; and BUMED INSTRUCTION 1520.14, respectively. Eligible Medical Service Corps officers are those who are currently assigned to billets with a direct relationship to the courses listed and should apply in accordance with BUMED INSTRUCTION 1520.12B:

<u>COURSE</u>	<u>INSTALLATION</u>	<u>DATE</u>
Principles of Medical Operations in Future Warfare	Medical Field Service School, Brooke Army Medical Center	23 Jul-24 Aug 1962 All Corps
Anesthesiology for NC Officers Seminar	Walter Reed Army Medical Center	10-14 Sep 1962 NC
Ophthalmic Pathology	Armed Forces Institute of Pathology	10-14 Sep 1962 15-19 Apr 1963 MC
Fundamentals of Medical Support in Future Warfare	Medical Field Service School, Brooke Army Medical Center	10-21 Sep 1962 4-15 Mar 1963 All Corps
Current Trends in Military Optometry	Walter Reed Army Institute of Research	24-28 Sep 1962 MSC
Orthopedic Pathology	Armed Forces Institute of Pathology	1 Oct-9 Nov 1962 MC

<u>COURSE</u>	<u>INSTALLATION</u>	<u>DATE</u>
Management of Mass Casualties	Medical Field Service School, Brooke Army Medical Center	8-12 Oct 1962 All Corps
Forensic Dentistry	Armed Forces Insti- tute of Pathology	8-12 Oct 1962 DC
NC Educational Coordinator and Instructors Course	Medical Field Service School, Brooke Army Medical Center	22-26 Oct 1962 NC
The Pathology of Radiation Injury	Armed Forces Insti- tute of Pathology	22-26 Oct 1962 MC
Management of Mass Casualties	Walter Reed Army Insti- tute of Research	30 Oct-1 Nov 1962 All Corps
James C. Kimbrough Urological Seminar	Letterman General Hospital	5-7 Nov 1962 MC
Postgraduate Course in Preventive Dentistry	U. S. Army Institute of Dental Research, Walter Reed Army Medical Center	5-9 Nov 1962 All Corps
Forensic Pathology	Armed Forces Insti- tute of Pathology	14-18 Jan 1963 MC
Medical Nursing	Walter Reed Army Insti- tute of Research	14-18 Jan 1963 NC
Annual Armed Forces Institute of Pathology Lectures, 1963	Armed Forces Institute of Pathology	11-15 Feb 1963 MC
Surgical Nursing	Walter Reed Army Insti- tute of Research	4- <sup>2</sup> Mar 1963 NC
Application of Histo- chemistry to Pathology	Armed Forces Institute of Pathology	11-15 Mar 1963 MC, DC, MSC
Surgical and Orthopedic Aspects of Trauma	Brooke General Hospital	11-15 Mar 1963 MC, DC
Global Medicine	Walter Reed Army Insti- tute of Research	11-29 Mar 1963 MC
Pathology of the Oral Regions	U. S. Army Institute of Dental Research, Walter Reed Army Medical Center	11-15 Mar 1963 DC

<u>COURSE</u>	<u>INSTALLATION</u>	<u>DATE</u>
Management of Mass Casualties	Medical Field Service School, Brooke Army Medical Center	25-29 Mar 1963 All Corps
Pathology of Tropical and Other Exotic Diseases	Armed Forces Institute of Pathology	1-5 Apr 1963 MC, MSC
Postgraduate Course in Oral Diagnosis and Therapeutics	U. S. Army Institute of Dental Research, Walter Reed Army Medical Center	13-17 May 1963 DC

In view of the anticipated shortage of travel funds for fiscal year 1963 only a limited number of officers can be authorized to attend these courses on travel and per diem orders chargeable against Bureau of Medicine and Surgery funds. Eligible and interested officers who cannot be provided with travel orders to attend at Navy expense may be issued Authorization Orders by their Commanding Officers following confirmation by this Bureau that space is available in each case. Requests should be forwarded in accordance with instructions listed in paragraph 1, as appropriate, at least 3 weeks prior to commencement of the requested courses.

(Training Branch, Professional Division, BuMed)

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#### From the Note Book

MEND Orientation Tour. More than thirty deans and MEND coordinators of medical schools recently affiliated with the Medical Education for National Defense (MEND) Program were given a two-day briefing at various Navy facilities in the San Diego area. In visits to an aircraft carrier, a submarine flotilla, the Marine Corps Recruit Depot, and the Naval Air Stations at North Island and Miramar, they observed operational situations that generate special problems, and learned of the accomplishments of the Navy in meeting these problems. The purpose of the MEND Program is to develop and expand the teaching of military and disaster medicine to medical students. This year, 85 of 86 undergraduate medical schools are active participants, in addition to the Mayo Foundation Graduate School of the University of Minnesota.

Government support is from the Department of Defense and the three Armed Services, the Office of Emergency Planning, Department of Health, Education, and Welfare, and the Atomic Energy Commission. The Navy acts as Executive Agent for the MEND Program and has assigned CAPT Bennett F. Avery MC USN as National Coordinator. Mr. Ralph B. Hirsch is Administrative Assistant. The Scientific Officer for the MEND Program is CAPT Sidney D. Bond Jr, MC USN, Head of the Training Branch, Professional Division, BuMed. Doctor Bond's Program Assistant is Mrs. Evelyn L. Morgan.

Three Navy Commendation Medals

From Naval Air Advanced Training Command, U. S. Naval Auxiliary Air Station, New Iberia, Louisiana.

The Navy Commendation Medal has been awarded by the Secretary of the Navy to three Navy men for their courageous action in the rescue of personnel from a wrecked aircraft at Spanish Lake, near New Iberia, La., 13 June 1961.

The medals were awarded to LT Donald E. Hines MC USN, Flight Surgeon, attached to the U. S. Naval Auxiliary Air Station; LT Donald L. Miller USN, formerly attached to Training Squadron 27; and Arthur J. Hoeny, Hospital Corpsman Third Class, formerly attached to U. S. Naval Auxiliary Air Station, New Iberia, La.

These men disregarded their own personal safety and at personal risk from aircraft wreckage and gasoline-laden waters, persevered until the injured pilots were rescued and transported to safety by helicopter. Just before the arrival of the rescue team. Lt Miller, student pilot in the rear compartment of the crashed aircraft, not seriously injured, managed to get to the cockpit which was almost completely submerged. Both pilots in front were completely under water and LT Miller immediately went under water in an effort to free them. After unsuccessfully trying to unstrap the seat belts, he administered mouth-to-mouth resuscitation under water to his unconscious instructor. Then he cut the seat belts loose with his survival knife partially freeing his instructor enough to get his head above water, and continued to administer mouth-to-mouth resuscitation to the pilot. Meanwhile, the other pilot had regained consciousness and managed to keep his head above water.

After a helicopter located the crashed aircraft, Dr. Hines and Corpsman Hoeny were lowered into the water and began rescue operations. Dr. Hines and Hoeny repeatedly dived beneath gasoline and contaminated swamp water in their efforts to free the men trapped in this wreckage. Despite the handicaps of this murky, gasoline-laden swamp water and the torn aircraft wreckage, they persisted until both injured pilots and LT Miller, who also aided were hoisted safely into the helicopter.

Prior to the awarding of the Navy Commendations Medals, the three men were presented Letters of Commendation by their respective Commanding Officers, CAPT Francis R. Sanborn USN, Commanding Officer of the U. S. Naval Auxiliary Air Station, New Iberia, La., and CDR Ygnacio T. Toulon USN, Commanding Officer of Training Squadron 27.

CAPT Sanborn presented the Navy Commendation Medal to LT Donald E. Hines MC USN on 16 February 1962 at official ceremonies held during inspection. The other medals were forwarded to LT Donald L. Miller at Anti-Submarine Squadron Forty-One, Naval Air Station, San Diego, Calif., and to Arthur J. Hoeny HM3 at the U. S. Naval Hospital, Yokosuka, Japan.

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Developments at USNH - Chelsea, Mass.

Training of Nurses in Handling Mass Casualties. The U.S. Naval Hospital, Chelsea, during the last three years, has been helping to train nurses of the Boston metropolitan area in the handling of mass casualties. Under the direction of the Commanding Officer, CAPT L. Haynes and members of the staff have visited nursing schools to deliver lectures on mass casualties. This training has been given to over 5000 nurses. The program was organized to develop knowledge and technics which can be used with a minimum of equipment by improvisation and utilization of the type of supplies commonly available in the community. This has been a most worthwhile effort both as to training and to public relations.

Banks for Rare Types of Blood. A woman with an unusually rare type of Rh negative blood lost several babies because donors with that specific type of blood were not available. Subsequently, several units of her own blood were processed during her pregnancy and stored at the U.S. Naval Hospital, Chelsea. At the time of birth, her stored blood was used for transfusions into the baby and she now has a living child. The hospital has available 70 rare types of blood which can be provided without charge by clearing with the American Association of Blood Banks which sponsors the collection. These rare blood types are available to all military Services without such clearance.

Reports on Blood Preservation Program and Clinical Applications. A report on clinical applications of preserved blood was presented by CAPT L. Haynes at a meeting of the Canadian Defense Research Board in Ottawa, Canada. CAPT Haynes and Dr. J. Tullis of the Protein Foundation, Cambridge, Mass., will make a presentation on the Blood Preservation Program in May at the Southeast Asia Treaty Organization (SEATO) Meeting.

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New Location for Naval Nuclear Power School. Washington, D. C., 15 April 1962, NAVNEWS. The Naval Training Center, Bainbridge, Md., has been selected as the site of the new Naval Nuclear Power School. The first classes are scheduled to convene in July of this year. The ever increasing number of students in the nuclear power program have made necessary the addition of more classrooms, laboratories, berthing, and messing facilities than are presently available in the New London area where the Navy's nuclear power school is presently located.

A similar facility already exists at Mare Island, Vallejo, Calif., for training of West Coast personnel. The New London school will be vacated some time in the near future. The vacated space will then be utilized by the rapidly expanding Fleet Ballistic Missile Team Training program which requires an increase in facilities.

Accomplishments of Naval Medical Research Unit No. 4. This year, for the second time, NAMRU-4, U. S. Naval Hospital, Great Lakes, Ill., has sponsored a research project at the North Chicago Student Science Fair. The program which has been highly successful during its five years of operation at the North Chicago High School consists of weekly Science Seminars during which selected topics are presented by student members of the Seminar and discussed by participating scientists from local industry and the U. S. Navy. Students are also encouraged to prepare a science project under the supervision of a scientific advisor for the Science Fair held at the school every spring. The purpose of the seminar is to motivate, stimulate, and encourage talented young science students. The student membership is limited to those who have scored the highest on the Westinghouse Science Talent Search Examination.

Under the preceptorship of LT Michael Rytel MC USNR of NAMRU-4, Miss Patricia Pick carried out a project on the Chemistry of Phagocytosis, studying such subjects as the optimum temperature and pH of phagocytosis; the dynamics of the process, and the enzymatic pathways involved in energy release during phagocytosis. The project, one of more than 60 submitted, has won a Blue Ribbon at the local Science Fair, and was scheduled to be submitted to a regional contest to be held at Lake Forest College. From there it may go on to statewide competition in Springfield, Ill. Miss Pick, daughter of CWO R. J. Pick, Training Aids Officer at Recruit Training Command, is co-valedictorian of her class.

#### New Publications on Aviation Medicine and Space Biology.

Gravitational Stress in Aerospace Medicine, published by Little, Brown and Company, Boston, is the first in the series on Aviation Medicine and Space Biology from the Guggenheim Center for Aviation Health and Safety at the Harvard School of Public Health. Dr. Ross A. McFarland, Director of the Center, is general editor of the series. The first volume, edited by Otto H. Gauer and George D. Zuidema, contains chapters by fourteen contributors dealing with various aspects of acceleration physiology in relation to the specific requirements of aerospace flight.

Physical Anthropology in Equipment Design by Albert Damon, Howard W. Stoudt, and Ross A. McFarland, has been completed and is scheduled for early publication.

A third volume, entitled Environmental Influences on Behavior, has been prepared by Dr. McFarland and his associates and will appear in 1962.

(From University News Office, Director of Medical Information, Harvard University, Boston, Mass.)

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## DENTAL



## SECTION

Internal Splinting of Implanted Teeth  
With Polyester Resin Formulae

Capt R. A. Middleton, DC, USN, U.S. Naval Hospital, Oakland 14, Calif.  
IADR Abstracts of the Fortieth General Meeting, March 1962, Page 318.

A "bone glue," developed for orthopedic purposes, has been tested in dogs as "synthetic cementum," to stabilize implanted teeth during healing. One hundred and forty-four teeth (autologous, homologous, and alloplastic) were implanted in jaws of healthy Beagle dogs employing resin formulae which polymerized in situ, bonding the implants to the underlying bone. Twelve autologous implants served as controls and no splinting was employed except the normal pararadicular blood clot. Postoperatively, none of the experimental animals were restricted from routine kennel activity or diet. The plastic formulae functioned well temporarily, mechanically splinting the teeth, but unfortunately proved to be biologically incompatible and normal healing did not follow. In most instances, within 60 days, resorption of alveolar bone or tooth root, or both occurred and the implant was exfoliated. Cellular response was predominately lymphocytic with only occasional appearances of foreign body giant cells. The exceptions, which remained in the jaws and functioned for a year or longer, were 2 homologous and 5 autologous implants. Of the 12 control implants, 4 were taken as early (30 day) specimens, but 5 others continued to function well for over one year. Of these, 3 were taken as specimens after one year and the remaining 2 are still in an animal and appear roentgenographically intact after 16 months. Commercial resins are no longer being studied for orthopedic or dental use, but preliminary laboratory procedures are being conducted to substitute an extractable prepolymer of mammalian collagen for such applications. This extract remains in solution in neutral saline at 5°C but will polymerize in the presence of blood serum when raised to body temperatures.

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Although milk or fruit juice probably could serve as vehicles for fluorine, there is more certainty about the effectiveness of additions to water than about the other vehicles. Pending further knowledge, water is the vehicle of choice. (Bibby, B.G. 800 Main Street, Rochester, N.Y. Fluoridation. JAMA 178:95 Oct. 7, 1961; Dental Abstracts, March 1962.)

Benzalkonium Chloride - Source of Infection  
with Gram-Negative Bacteria

John C. Lee and Philip J. Fialkow, University of California School of Medicine, San Francisco, Calif. JAMA 177:708-710, 9 September 1961. Dental Abstracts 7(3): 165-166, March 1962.

Quaternary ammonium compounds have many useful attributes as disinfectants, and have been recommended for cold sterilization of instruments which cannot be autoclaved. However, since 1957 several reports have stressed the risks of using these compounds for skin disinfection. Aqueous solutions of these compounds lose most of their antibacterial properties if stored with cotton fibers or protein. After accidental contamination of quaternary ammonium compound solutions, some organisms, particularly gram-negative bacteria, may survive and multiply and may then be applied with cotton to the patient's skin prior to needle puncture.

A patient was admitted to the University of California Medical Center with a diagnosis of bronchial asthma, acute bronchitis and pneumonitis. Smears of sputum contained mainly gram-positive cocci; therefore, the patient was treated with penicillin. She responded favorably and was discharged 10 days later. A blood culture obtained on admission yielded a gram-negative bacterium, subsequently identified as a member of the *Pseudomonas-Achromobacteriaceae* groups; the bacterium played no demonstrable role in this patient's disease.

However, in the next 6 weeks the same organism was recovered from 15 patients, all but one of whom were located on the same floor of the 15 story hospital. In 4 of the patients, clinical sepsis was associated with isolation of the gram-negative bacterium from the blood stream; two of these patients subsequently died, and in both the gram-negative organism was believed to have been a contributory cause of death.

An effort was made to determine the source of the organisms. An identical bacterium was ultimately recovered in a culture taken from a container of cotton pledgets soaked in a 1:1,000 aqueous dilution of benzalkonium chloride. These cotton pledgets were used for cleansing the skin prior to intramuscular injections and venipunctures, and before obtaining specimens for urine cultures. They were not used in the preparation of skin for blood cultures.

The containers with benzalkonium chloride and cotton pledgets were supplied to the individual hospital floors by the central supply room. Here sterile cotton was placed in sterile containers by the ungloved hand of the worker, and 1:1,000 aqueous benzalkonium chloride was added. The solution was prepared in the hospital manufacturing laboratory using unsterile glass containers and deionized, but unsterile, water. Ward personnel frequently removed cotton pledgets with their fingers prior to skin preparation. Thus, several sources of contamination were possible. It was demonstrated that organisms of the *Pseudomonas-Achromobacteriaceae* groups isolated from

the patients described could survive in a benzalkonium chloride and cotton mixture similar to that used in the wards. Their survival in supposedly sterile cotton pledgets presents a considerable hazard to the hospital population. Cellulose or protein actively adsorbs quaternary ammonium compounds and severely reduces their bactericidal properties. Cellulose fiber soaked in these compounds should not be used for routine preparation of skin for intramuscular or intravenous injections.

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### Continuing Education of the Dentist

B. L. D., New York State Dental Journal, October 1961.

Continuing education of the dentist is his uninterrupted participation in study and learning from the day of his graduation from dental school until the day he ceases practice.

There is no disagreement about the importance of continuing education; only in the methods of implementation. The recently completed Survey of Dentistry in the United States refers rather pointedly in a number of different places to the need for continuing education, and refers specifically to a number of ways in which it is conducted.

Russell S. Poor says, "Probably the first responsibility of any professional person is continuing or postgraduate education. To win greater confidence in himself and to merit respect from his patients, a man who elects to become a member of a health profession must dedicate himself to a life of never-ending self education."

The term "self education" carries very serious connotations. It doesn't simply mean that a man must read books or even that he should attend postgraduate courses. It means that he must feel a sense of responsibility as a public servant to maintain contact with the changing professional, scientific, and social scene. To do this effectively requires some degree of self-sacrifice throughout professional life.

Some dentists enjoy engaging in formal postgraduate study immensely. They do not consider it a sacrifice to pay for such study and to take time away from their families and practices to do so. They find learning to be stimulating as well as practical. Other dentists find continual contact with the changing facets of dental practice necessary and profitable from a purely utilitarian point of view. But there are all too many dentists who accept their dental school diplomas with a feeling of finality and confine their so-called "continuing education" to their offices and their patients.

A dentist who learns only by doing and by making mistakes is blundering through the most inept educational technique known to man—that of trial and error. Trial-and-error learning, or learning by one's mistakes, is inadequate and dangerous when the health of a human being is at stake.

There is a trend today in organized medicine to develop periodic re-examination procedures for practicing physicians. Mandatory postgraduate

examinations could eventually come into being for both physicians and dentists; but such a radical means of insuring the doctor's contact with continuing education should not be necessary with mature professional people.

Organized dentistry today is expending a large part of its resources to provide facilities for the continuing education of its members. Dental schools all over the country have countless numbers of courses in every conceivable subject. Large numbers of dental societies have highly organized postgraduate programs. Numerous other organizations allied to dentistry and related professions offer every enticement, including ocean cruises, visits to the country and the seashore, and trips abroad, to encourage dentists to meet together, to study, and to learn from one another.

Dentistry is no exception to the machinations of Father Time. It changes as the world changes. To keep abreast of those changes, the dentist is obliged to participate in a continuing formal program of postgraduate education.

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#### Personnel and Professional Notes

Capt Bernhausen Presents Table Clinic. On 22 March 1962, Capt E. R. Bernhausen, DC, USN, U.S. Naval Support Activity, London, presented a Table Clinic "Custom Made Trays for Impression with Reversible Hydro-Colloid" before some 75 members of the American Dental Society of London, at Eastman Dental Hospital, London, England.

Capt Flocken Presents Clinic. On 2 April 1962, Capt John E. Flocken, DC, USN, Crown and Bridge Division, U.S. Naval Dental School, NNMC, Bethesda, Md., presented a projected clinic entitled "Selected Short Subjects of Crown and Bridge Construction" before the Southern Maryland Dental Association meeting held in Washington, D.C.

Capt Fowler Retires. Capt William M. Fowler, DC, USN, Diplomate, American Board of Prosthodontics, was placed on the temporary disability retired list of the Navy on 1 March 1962. A graduate of Emory University, Atlanta Southern Pines, Capt Fowler reported to the U.S. Naval Hospital, Parris Island, S.C., in April 1936 for his first tour of active Naval Service. He served in the USS Lexington and the USS Wyoming and in the Personnel Branch, Bureau of Medicine and Surgery from 1946 to 1949. Prior to retirement he was the Senior Dental Officer at the Marine Corps Recruit Depot, Parris Island.

NAS Alameda Dental Department Selected Again. The "Commanding Officer's Honor Division of the Month" plaque was awarded to the Dental Department, U.S. Naval Air Station, Alameda, Calif., at the monthly personnel inspection. Since the inauguration of this program in October 1959, this Department has won the coveted plaque six times with the distinction of winning it for three

consecutive months. Selection is based on results of the Commanding Officer's monthly inspection in areas of discipline, traffic safety, material improvements and personnel participation in voluntary training programs and correspondence courses.

Capt F. I. Gonzales, Jr., DC, USN, is the Senior Dental Officer.

Items Reclassified. The following items have been reclassified to limited standard type because of a decreasing requirement and low issue rate. On hand stocks will be issued until depleted.

FSN 6520-503-3000	BUR, Dental, Excavating, AHP, Steel No. 1/2
FSN 6520-503-5000	BUR, Dental, Excavating, AHP, Steel No. 2
FSN 6520-503-6000	BUR, Dental, Excavating, AHP, Steel No. 4
FSN 6520-503-6250	BUR, Dental, Excavating, AHP, Steel No. 4 ShortNeck
FSN 6520-503-7000	BUR, Dental, Excavating, AHP, Steel No. 6
FSN 6520-503-9000	BUR, Dental, Excavating, AHP, Steel No. 8
FSN 6520-504-1000	BUR, Dental, Excavating, AHP, Steel No. 33-1/2
FSN 6520-504-3000	BUR, Dental, Excavating, AHP, Steel No. 35
FSN 6520-504-3250	BUR, Dental, Excavating, AHP, Steel No. 35 ShortNeck
FSN 6520-504-4000	BUR, Dental, Excavating, AHP, Steel No. 37
FSN 6520-504-5000	BUR, Dental, Excavating, AHP, Steel No. 39
FSN 6520-505-2000	BUR, Dental, Excavating, AHP, Steel No. 557
FSN 6520-505-3000	BUR, Dental, Excavating, AHP, Steel No. 558
FSN 6520-505-3250	BUR, Dental, Excavating, AHP, Steel No. 558 ShortNeck
FSN 6520-505-4000	BUR, Dental, Excavating, AHP, Steel No. 559
FSN 6520-505-5000	BUR, Dental, Excavating, AHP, Steel No. 560
FSN 6520-505-7000	BUR, Dental, Excavating, AHP, Steel No. 700
FSN 6520-505-9000	BUR, Dental, Excavating, AHP, Steel No. 702

Capt Loving Presents Lecture. On 12 March 1962 Robert H. Loving, DC, USN, Diplomate, American Board of Periodontology, and head of Periodontics Department, U. S. Naval Dental Clinic, Norfolk, Va., presented a lecture at the Peninsula Dental Society in Newport News, Va., entitled Periodontal Problems.

LCdr Armstrong Presents Slide Lecture. LCdr W. P. Armstrong, DC, USN, Assistant Dental Officer, USS Saratoga (CVA-60) appeared as guest lecturer before the Societe d'Odonto-Stomatologie du Var of Toulon, France, on 19 March 1962. Dr. Armstrong presented a slide illustrated lecture entitled, The Preparation and Restoration of Multiple Carious Lesions.

Capt Brandon Presents Lecture. Capt W. C. Brandon, Jr., DC, USN, U. S. Naval Hospital, San Diego, California, presented a lecture to the Southern California Academy of Endodontists, held at the Hilton Statler Hotel, Los Angeles, Calif., on 15 March 1962. The title of his lecture was The Cortico-Steroid Treatment of Embarrassed Pulpal Tissues. Indications, contraindications,

and experience with the drug Meticortelone in 150 controlled cases were discussed.

Capt Flocken Appears at Hinman Meeting. Capt John H. Flocken, DC, USN, Crown and Bridge Division, U. S. Naval Dental School, NNMC, Bethesda, Md., presented a television lecture and demonstration entitled Modern Rubber Base Techniques for Fixed Prosthodontics. The presentation was made at the Thomas P. Hinman Dental Meeting, Atlanta, Ga., held 25-28 March 1962.

Appointments in the Dental Corps, U. S. Navy. The following candidates were selected for appointment in the Dental Corps, USN, by a Naval Examining Board which met 13 February 1962 in the Bureau of Medicine and Surgery:

Lieutenant Commanders:

Cagle, John D.  
Sazima, Henry J.  
Taylor, "B" Frank  
Zapski, E. G.

Lieutenants:

Barber, F. M.  
Beisner, J. D.  
Brose, M. O.  
Cassidy, R. E.  
Chapman, T. H.  
Comer, R. M.  
Dunston, W. T.  
Gibson, C. R.  
Gilham, L. R. Jr.  
Glazer, S. A.  
Greer, D. F.  
Hall, D. L.  
Hamilton, S. M. Jr.  
Hardy, R. C.  
Holroyd, S. V.  
Johnson, B. H.  
Kelly, J. F.

Lieutenants (contd.)

Kimball, K. R.  
Kimpel, W. A.  
Knoll, L. F.  
Krysinski, T. T. Jr.  
Lehnan, P. C.  
Lekas, J. S.  
Lowman, J. V.  
McCherry, R. J.  
McWalter, G. M.  
Morrissey, W. J. Jr.  
Murphy, J. D.  
Nissenson, M.  
Rober, W. Z.  
Rupp, G. M.  
Sawyer, H. G. Jr.  
Semler, H. E. Jr.  
Sullivan, W. C.  
Todd, R. A.  
Tully, J. J.  
Uveges, A. C.  
Yacabucci, J. E.

Lt. Col. J. W. Turner, Royal Canadian Dental Corps, Presents Lecture. Lieutenant Colonel Jay W. Turner, Royal Canadian Dental Corps, an instructor on the staff of the U. S. Naval Dental School, NNMC, Bethesda, Md., presented a paper on 4 May 1962 entitled "Reinforced Amalgams" before members of the York County (Pa.) Dental Society. The meeting was held at the Lincoln Woods Inn, York, Pa. Lt. Col. Turner is assigned to the staff of the U. S. Naval Dental School for a period of 2 years as an exchange instructor from the Royal Canadian Dental Corps. Cdr R. E. Troxell DC USN, his counterpart in this exchange program, is assigned for a like period on the staff of the Royal Canadian Dental Corps School, Camp Borden, Ontario.

DEPARTMENT OF THE NAVY  
Office of Information  
Washington 25, D.C.

CHINFO 5060  
OI-300  
20 March 1962

CHINFO NOTICE 5060

From: Chief of Information  
To: All Ships and Stations

Subj: 50th Anniversary of U.S. Naval Dental Corps; announcement  
of

1. Purpose. To establish the period of 1 July - 31 December 1962 to commemorate the 50th Anniversary of the founding of the U.S. Naval Dental Corps.

2. Discussion. On 22 August 1912, the Second Session of the Sixty-Second Congress passed an act authorizing the Secretary of the Navy "... to appoint not more than 30 acting assistant dental surgeons to be a part of the Medical Department of the United States Navy . . . ." The bill was signed by President Taft. Accordingly, 22 August has been observed each year as the anniversary of the U.S. Naval Dental Corps. This year, the anniversary date will mark 50 years since establishment of the Corps.

3. Action. Commanding officers of ships and stations are requested to provide for such ceremonies and activities as may be appropriate and feasible to mark the observance of the 50th Anniversary of the U.S. Naval Dental Corps. The purpose of the observance will be to inform naval personnel and the general public of the accomplishments of the Dental Corps and of the benefits that accrue to naval personnel through the efforts of the Corps. Suggested means for achieving this purpose are as follows:

a. Publication in ship and station papers of photos and articles distributed through NavNews.

b. Publicizing the activities of ship and station dental clinics with emphasis on the contribution to the overall health of the Navy.

c. Cooperation with fleet, force, and district dental officers, who will receive more detailed instructions from the Bureau of Medicine and Surgery.

4. Cancellation. This Notice is canceled when the action has been completed, or for record purposes 31 December 1962.

D. F. SMITH, Jr.

Distribution:  
SNDL Parts 1 and 2  
MARCORPS List 5



## OCCUPATIONAL MEDICINE

### The American Board of Industrial Hygiene

Cdr G.A.L. Johnson, MSC, USN, has been certified in the "Comprehensive Practice of Industrial Hygiene" by the American Board of Industrial Hygiene. Announcement of his certification was received on 3 April 1962. Commander Johnson is serving as Head, Industrial Hygiene Branch, Occupational Health Division, Bureau of Medicine and Surgery. —Editor.

\* \* \* \* \*

### Glue-Sniffing

National Clearinghouse for Poison Control Centers. US PHS, DHEW, Feb-Mar 1962.

The problem of "glue-sniffing," which was alluded to in the December, 1960 Bulletin of National Clearinghouse for Poison Control Centers, continues to be a frequently encountered form of aberrant behavior among teen-agers. Reports to this office from Chicago, Texas, California, and Colorado, as well as a newspaper report in Washington, D.C. and a report from Arizona, attest to the public concern which has been aroused over this pastime. Other substances, mainly thinners containing the same type of solvents, have been used in Sweden for the same purposes.

There have been few changes during the past year in the evidence for or against toxic effects resulting from the practice of inhaling these fumes repeatedly. It seems clear that such inhalation can cause a syndrome resembling acute alcoholic intoxication, and it remains unclear as to whether or not repeated inhalations can result in chronic toxicity. Fairly extensive investigations are currently being carried out in Utah, however, and these are of enough interest from the sociologic and physiological points of view, as well as from the toxicological point of view, to warrant a report on them.

In Salt Lake City 12 boys ranging from 14 to 18 years of age were interviewed and subjected to certain laboratory tests. These boys had been contacted through the cooperation of the juvenile court and were chosen because they were known to have indulged in glue-sniffing. The interviews brought out two important facts. First, according to these boys, the intentional

inhalation of organic solvent fumes from such products as plastic cements is widespread in the Salt Lake City Area, to the extent that in one small town the practice was considered virtually universal among teen-age boys. Girls, as yet, have not been widely involved.

The second fact brought out by the interviews was that these organic solvents appeared to be satisfactory for the purposes for which they were inhaled, specifically, for the production of a variety of effects resembling acute alcoholic intoxication. Thus, no matter what particular product was used to achieve the effects, these boys all recalled being "drunk," "dizzy," or euphoric. A number described vivid dreams, often in color, or hallucinations, and it was sometimes difficult to distinguish between these two. There was some evidence that these feelings either could or did lead to impulsive or destructive behavior, possibly even more frequently than in persons acutely intoxicated by ethyl alcohol. The three boys who reported hearing unreal sounds during the acute intoxication all described hearing "sirens." This was felt by the subjects to be distinct from tinnitus. Nine of the 12 boys showed evidence of becoming increasingly tolerant to the acute effects of the inhalation of these fumes. Seven of the boys had previously inhaled the fumes of other substances, notably the fumes of gasoline (6 boys), ether, and nasal inhalers (1 each), and one of these boys had been smoking marijuana. All of the boys claimed that they could give up the practice, but few of them seemed inclined to do so unless a satisfactory substitute could be obtained, although a number of the boys indicated a dislike for the practice, persisting in it only to be acceptable to their groups.

The problem of chronic toxicity resulting from repeated inhalations of the fumes of plastic cements (or other organic solvents) is somewhat more difficult to assess. This is partially because there was a wide variation in the duration of the habit and the frequency of exposures, and because several of the boys had been exposed to other inhalants. For example, the fewest exposures were reported by a boy who had been exposed every other day for one week, but this youth had previously practiced the inhalation of fumes of ether, lighter fluid and gasoline. Three boys had had daily exposure for 2 to 3 weeks, and others had had less frequent (e.g. weekly or less) exposures for as much as a year. Although some parents indicated that there had been deterioration of the scholastic performance and social relationships of the boys, there was no evidence of neurological impairment or intellectual dulling in any of them. One boy, however, sniffed glue so frequently that he remained confused and irrational for 2 to 3 weeks until his supply of glue was cut off (in the hospital), whereupon he recovered.

Routine hematological examinations were unremarkable, and no evidence of liver damage was revealed by bromsulphalein (BSP) excretion and measurement of the serum glutamic oxalacetic transaminase (SGOT) levels. Two serum bilirubin determinations were normal.

Examination of the urines of these boys, on the other hand, revealed some impressive abnormalities. While there was no evidence of a general inability to concentrate the urine among the various samples taken, urines of

5 subjects revealed, on one occasion each, at least a trace of protein. One of these showed 4+ proteinuria, although 2 determinations approximately one month later revealed no protein. The most striking finding, however, was that 8 of the 12 examined had at least once an abnormal number of leukocytes in the urinary sediment. Five had subsequent Addis counts of which 3 revealed abnormal numbers of white cells. One of the abnormal counts was in a boy who was later discovered to have urinary tract stones. The only one with a "normal" initial urine also showed an abnormal number of white cells by the Addis count. Urine from 2 showed granular casts, but one of these had a subsequent normal Addis count, and the other has not yet had a repeat test. In addition to the patient found to have stones, one boy had microscopic hematuria, which had cleared by the time a subsequent normal Addis count was performed. Blood urea nitrogen levels and urea clearances were normal in 6 instances in which they were performed.

The evaluation of these urinary findings is hampered by the fact that several (but not all) of these boys had been exposed previously to the fumes of other solvents, such as gasoline, and by the fact that the degree of exposure subsequent to the initial interview is unknown, since many of the boys might be reluctant to admit continued exposure. Studies are currently being carried out to evaluate more thoroughly the suggestion presented by these data that urinary abnormalities may be associated with the repeated inhalation of organic solvent fumes.

On the other hand, 3 teen-age youths who were seen in Denver, Colorado, for the repeated inhalation of plastic cement fumes had normal urines. Blood counts, blood urea nitrogens, and SGOT levels were also normal in these children. They had had enough exposure to the fumes to experience euphoria and disorientation.

Preliminary observations on the effects of chronic, recurrent sniffing of organic solvents were also made in Sweden. The subjects were 32 boys between the ages of 12 and 15 years, of whom at least half had practiced glue-sniffing frequently. Urinalyses were normal in these children, as were the erythrocyte sedimentation rate, the serum proteins, serum protein electrophoresis, and the thymol turbidity test. Although 5 of the boys had palpable livers one to two fingerbreadths below the costal margin, there was no unequivocal evidence of increased bromsulphalein retention in any of them. Hematologic studies on the peripheral blood were normal, except for some basophilic stippling of the red blood cells. A number of bone marrow aspirations were thought to reveal such abnormalities as inhibition of maturation of the erythropoietic and myelopoietic series. The authors also reported certain electroencephalographic changes resulting from acute inhalations of these solvents, and these appeared to be related to somnolence. The solvents involved in the Swedish report included ethyl and butyl acetates, ethyl and butyl alcohols, and methyl-isobutylketone; but the predominant solvent was toluene, probably containing a very small admixture of benzene. Attempts to detect alcohol excretion in the urines of some of the subjects were unsuccessful. The authors indicated that they were planning to investigate the reversibility of the effects they had noted.

By all odds the organic solvent most frequently encountered in plastic cements is toluene, but other solvents include xylene, methyl isobutylketone, methyl cellosolve acetate, isopropyl alcohol, methylethyl ketone, acetone, ethyl acetate, or combinations of some of these. In addition, ether, chloroform, methanol, and petroleum naphtha hydrocarbons have been encountered in cleaning fluids and lighter fluids, the fumes of which have been inhaled for the intoxicating effect.

An interesting and pertinent experience was recently reported wherein 8 workers were exposed to fumes which upon analysis proved to contain approximately 90% xylene. Of these 8 workers, 6 had symptoms within the first 4 days of working in these fumes. Five of these workers had headaches and 5 had coughs; several had evidence of local irritation to their respiratory tracts and 3 had fevers. One worker had dizziness and anorexia. All 6 patients had proteinuria (trace to 1 plus), microscopic hematuria (3 to 4 rbc/hpf), and pyuria (1 to 25-30 wbc/hpf). Two of these patients had previously had abnormal urinary findings for various reasons, but the others had been normal. One patient had red blood cells and a trace of protein in his urine one year following exposure, although he was asymptomatic.

The toxic effects of the other solvents used in these plastic cements involve, in general, a depressant action on the central nervous system, which is, indeed, much of the reason for the practice of sniffing their vapors. Their maximum allowable concentrations range from 25 ppm for methyl cellosolve acetate, through 400 ppm for ethyl acetate and isopropyl alcohol to 1000 ppm for acetone. Petroleum naphtha and gasoline, which were reported as other sources of sniffed fumes in the Utah study, have maximum allowable concentrations of 500 ppm. Of the solvents, methyl cellosolve acetate has been reported to cause significant damage to the kidney after repeated inhalations of relatively high concentrations. Gleason, Gosselin, and Hodge allude to the possibility of kidney and liver damage caused by isopropyl alcohol, and Browning suggests that acetone causes kidney damage.

By speculation, projection, and imagination one can thus build up quite a case for the potential hazards of the repeated inhalation of organic solvents such as those used in plastic cements. It behooves us, however, to ascertain facts in this regard. Done inferred from his contact with a number of boys who practice glue-sniffing that they could and would give up the practice readily if convinced of the dangers involved. At the same time, however, it became evident that transparent misinformation or contradictory statements by authorities concerning the dangers of these practices would be completely disregarded by these individuals and taken as evidence that none of the information was true. It also became apparent that, if they gave up glue-sniffing, they would take up other habits which would provide a comparable effect. Done points out that, in our present state of knowledge, toluene (one of the more commonly used solvents in plastic cements) is considerably safer than many other organic solvents.

At any rate, the study of this practice provides an excellent opportunity for increasing our knowledge of the toxicology of these organic solvents,

particularly the effects of repeated inhalations of relatively high concentrations of them. In fact, such knowledge might greatly abet effective measures of preventing the continuation and spread of this practice. The National Clearinghouse for Poison Control Centers would welcome information on the clinical and laboratory observation of youths who have been inhaling organic solvents.

\* \* \* \* \*

A Toxicologist's View of Threshold Limits \*

Henry F. Smyth, Jr., PhD, Mellon Institute, 4400 Fifth Avenue, Pittsburgh, Pa. Amer Ind Hyg Assc J 23: 37-43, Jan-Feb 1962.

The author relates that he is on record<sup>1</sup> as concluding that experimental study of the effects of repeated inhalation by animals has been as sound a basis for setting threshold limits as any other basis which has been used for the values of the American Conference of Governmental Industrial Hygienists (ACGIH). A considerable proportion of the values set on any basis has been modified later as experience has accumulated, and the proportion has been no greater for those based on experimental toxicology than for other bases. It is the collection of experience through industrial hygienists and industrial physicians, with annual reconsideration of values, which has made the threshold limits lists dependable.

However, some details are suggested by toxicological considerations. All that the writer has to say in this article is related to the paragraph which has been used for several years as part of the foreword to the annual tables of threshold limits issued by the American Conference of Governmental Industrial Hygienists.<sup>2</sup> He quotes: "Threshold limits should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations. They represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day, without adverse effect. The values listed refer to time-weighted average concentrations for a normal workday. The amount by which these figures may be exceeded for short periods without injury to health depends upon a number of factors, such as the nature of the contaminant, whether very high concentrations even for short periods produce acute poisoning, whether the effects are cumulative, the frequency with which high concentrations occur, and the duration of such periods. All must be taken into consideration in arriving at a decision as to whether a hazardous situation exists. Special consideration should be given to the application of these values in the evaluation of the health hazards which may be associated with exposure to combinations of two or more substances."

Discussion in this paper concerns points suggested by 3 phrases from the quoted paragraph: "The time-weighted average concentration," "The amount by which these figures may be exceeded," and "Without adverse effect." There follows a brief summary of the author's own exploration of the conditioned reflex, which leads out of his discussion of the third phase.

### "Time-Weighted Average Concentrations":

In summary, when Z-37 and ACGIH standards for inhalation are numerically identical, conformance with the Z-37 standard results in absorption of less toxicant than does conformance with the ACGIH standard. For about half the substances listed the ACGIH concept is physiologically wrong. The Z-37 concept, while likewise physiologically wrong for half the substances in the ACGIH list, errs on the side of safety. Health would be more consistently protected if all standards were written in terms of maximum peak concentration during a working day, rather than in terms of the time-weighted average throughout the day.

### "The Amount by Which These Figures May be Exceeded":

The ACGIH Committee contemplates that some operations will be conducted in concentrations above the threshold limit for brief periods, for they devote an entire sentence to suggesting the pertinent factors to be considered. Many industrial hygienists are qualified to interpret these pertinent factors for specific substances. Many others, including even lawyers, may blindly rely upon the threshold limits as averages of exposures to unlimited peak concentrations, and this reliance may result in harm to those exposed. How can the Threshold Limits Committee better guard against such misinterpretation?

It seems to be practically impossible to conduct some industrial operations without exposing workmen to concentrations above the threshold limit when the particular substance has a threshold limit which guards against acute toxicity, such as that for arsine; workmen may be seriously injured by relatively brief peak exposures. The operation should be fully automated, or if a workman must be present, adequate personal protection must be provided, maintained, and consistently used. When the substance has a threshold limit which guards against eye, nose, and throat irritation and is far below an injurious concentration, such as acetaldehyde, exposures well above the threshold limit can have no effect except to produce complaints from workmen, and some workmen will perceive no discomfort.

It ought to be possible to agree upon the penalty to health which may be exacted if a threshold limit is exceeded, even continually, and to indicate this in tabulations, as a guide to the solution of problems where operations under the limit are impractical. It is very difficult to find this information in the literature, partly because the bases for threshold limit values have not been explicitly stated by the ACGIH Committee until very recently.

### "Without Adverse Effect":

The threshold limits values are stated to be guides to conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effects. They are not fine lines between safe and dangerous conditions. Hence most industrial hygienists do not lose faith in the soundness of the values

when they learn that every year a few are changed, usually downwards, as a result of industrial experience which comes to the attention of the Committee. However, serious uncertainty was evoked several years ago when it was rumored that values enforced in Russia are in some instances one-tenth or less of the ACGIH values. It was obvious that such a difference could be due only to a difference in concept of what the values should accomplish, because it is thoroughly demonstrated in American industry that guidance by the ACGIH values results in safe working conditions. Nevertheless, lack of information fostered doubts.

In this country the Russian values for concentrations of contaminants in the working environment first became generally known and debated following the XII International Congress on Occupational Health in Helsinki in 1957. The paper by Smeljansky was particularly noteworthy, stating that the concentrations considered safe, and enforced in Russian industry, are lower than in the United States for a number of vapors. The basis for the values was stated to be experimental studies using the Pavlov conditioned reflex technique.

### Exploration of Conditioned Reflex

About 18 months ago, the author's group set out to explore the utility of the conditioned reflex technique, with much less knowledge of the Russian methods than they now have. A research grant for further work in methodology has been authorized by the National Institutes of Health (OH-16).

There are American reports of one middle-aged woman and two young adult males who worked for several weeks in noticeably high, but unmeasured concentrations of mixed vapors containing the monomethyl ether of ethylene glycol (methyl cellosolve solvent). The three were incapacitated, with headache, drowsiness, forgetfulness, and disorientation, diagnosed as "toxic encephalopathy," and attributed to inhalation of methyl cellosolve. The workers returned to normal after a few weeks of rest in a hospital, without other therapy. A survey of one establishment using the same mixed solvent in the same way, found 8 of 19 workers with non-disabling symptoms suggesting the same injury. Because of these observations, several attempts were made to produce such symptoms in animals. The symptoms were not found, but no specialized behavioral techniques were used at that time.

This recorded experience suggested methyl cellosolve as a useful substance for exploratory studies of the utility of the conditioned reflex technique. Would such symptoms in over-exposed humans have been predicted had behavioral studies been understood and applied before methyl cellosolve was first used industrially, and would the threshold limit be lower than it now is?

With no knowledge of the Russian methods, the group trained rats in a conditioned avoidance response. At the sound of a buzzer, they climbed a pole, because originally they had received an electric shock while standing on the floor when the buzzer sounded.

Inhalation of methyl cellosolve for 4 hours daily for several days reduced the number of rats which climbed the pole when they heard the buzzer,

but up to a lethal concentration all rats were able to climb when given the electric shock. Inhalation of the vapors reduced the effect of conditioning, but left them able to climb to escape pain. The number of rats affected increased with the days of inhalation, but seemed to reach a maximum by 14 days. The effect seemed minimal at 125 ppm, 5 times the ACGIH threshold limit. Some rats, allowed to rest for 14 days without inhalation, returned to the conditioned behavior without retraining.

Contrasted with the behavior of methyl cellosolve, ethyl alcohol produced no such behavioral change short of a concentration which caused frank depression and ataxia.

This exploratory work, by conditioned reflex methods possibly less sensitive than the Russian methods, does not show an effective concentration lower than the current ACGIH threshold limit, with a vapor to which has been attributed transient human disability arising in the central nervous system.

### Summary

Experience in this country with threshold limits based upon toxicological experiment with animals has been good.

Despite the fact that the limits are used only as guides, and are not sharp lines separating safe from injurious atmospheres, more consideration should be given to the condition the numbers are meant to represent. In particular the time-weighted average concentration is physiologically wrong for about half of the limits, and can result in injurious exposures. If the threshold limits referred to a maximum concentration existing at any time during the working day, the substances for which this is physiologically wrong, would be controlled by a conservative standard.

Tables of threshold limits would be more useful if they indicated the injury which could result from a small excess, in order to guide the management of exposures where full conformance is impossible.

The philosophy of the Russian maximum allowable concentrations seems to be that workmen should not be exposed to any concentration which produces a detectable physiological response, with no consideration as to whether such a response is harmful.

An exploratory study of the conditioned reflex behavioral technique indicates that the method may detect effects which other toxicological methods do not suggest.

### References

1. Smyth, H. F. Jr. : The Toxicological Basis of Threshold Limit Values. I. Experience with Threshold Limit Values Based on Animal Data. Amer. Ind. Hyg. Assoc. J. 20: 341 (Oct. 1959).
2. ACGIH: Threshold Limit Values for 1960. AMA Arch. of Envir. Health. 1: 140 (Aug. 1960).

\* This paper was presented at the Tenth Annual Conference of the Pennsylvania Department of Health, University Park, Pennsylvania, on August 23, 1961.

**RESERVE****SECTION**Promotions

Congratulations to the following Naval Reserve Medical Department Officers on inactive duty who were selected for promotion by a selection board convened 27 February 1962:

To Captain - Medical Corps

Henry R. Cooper  
William W. Gist  
Charles P. Roberts  
Robert W. Sheldon  
Robert E. Switzer

To Captain - Medical Service Corps

Edward G. Rietz  
Lloyd E. Rozeboom  
Harry M. S. Watkins

To Commander - Medical Corps

Hassan Abtahi  
Frank F. Allen  
Howard J. Barnhard  
William A. Cherry  
J. P. Cole  
William E. Crisp, Jr.  
Albert I. Decker  
Jack Dunn, Jr.  
Frederic W. Easton  
John N. Fogel  
William D. Francisco  
Allan V. N. Goodyer  
William M. Groton  
George D. Hammond  
John C. Hanley  
Walter T. Hausheer

To Commander - Medical Corps (contd)

Leo G. Horan  
John Jofko  
Melvin F. Johnson, Jr.  
Eugene G. Laforet  
Lyndon H. Landon, Jr.  
Robert L. Lasher  
Robert S. Long  
Leroy F. Lundy  
Jacob Malin  
Robert C. McCorry  
Paul S. Metzger  
Daniel F. Milam, Jr.  
Don R. Miller  
Sanford A. Mullen  
James B. Neville  
Vaun A. Newill  
William F. Oren  
Jarvis H. Post  
Oscar M. Powell, Jr.  
Donald F. Robinson  
Edward J. Sanders  
Reinhard S. Speck  
Harry W. Stuermer  
Melvin B. Sullivan  
Vernon L. Summers  
Edward E. Tennant  
Henry J. Teufen, Jr.  
Harold M. Voth

(continued on page 40)

Naval Reserve Medical Officer Honored

On 1 April the University of Notre Dame conferred its highest honor upon one of the Navy's most distinguished Medical Officers—Rear Admiral Francis J. Braceland, MC, USNR, Retired—when it presented to him The Laetare Medal for 1962. In announcing the award, the Reverend Theodore M. Hesburgh, C.S.C., University president, said: "As a physician, educator and Naval Officer, Dr. Braceland has served with rare distinction. Throughout his professional life he has exemplified the competence of modern medical science and a compassion born of his ancient Christian faith. In these times of prolonged anxieties and tensions, he symbolizes the concern of psychiatry and the Church for those who are troubled in mind and spirit. It is with pride that the University of Notre Dame awards to Dr. Braceland the highest honor within its power to bestow, The Laetare Medal."

Doctor Braceland is the eighth physician, but the first psychiatrist, to receive the medal, which is generally regarded as the most significant award conferred on Catholic laymen in the United States. Since it was established in 1883, the Laetare Medal has been presented to sixty-four men and sixteen women—soldiers and statesmen, artists and industrialists, diplomats and philanthropists, educators and scientists. President Kennedy received the Medal last year. It is a solid gold disc suspended from a gold bar bearing the inscription: "Laetare Medal," and in a border around the disc are the words "Magna est veritas et praevalerebit"—Truth is mighty and will prevail. On the reverse side of the medal the inscription is fashioned according to the profession of the recipient.

During his active duty Admiral Braceland was assigned to the Bureau of Medicine and Surgery as Head of the Neuropsychiatry Branch of the Professional Division. In May of 1956, after serving a year as president-elect, Doctor Braceland assumed the presidency of the American Psychiatric Association; and at present he is the Psychiatrist in Chief of The Institute of Living at Hartford, Connecticut, in addition to being a clinical professor of psychiatry at Yale University.

In 1958 Doctor Braceland was promoted to Rear Admiral, Medical Corps, U. S. Naval Reserve. On 1 September 1961 he was placed on the Naval Reserve Retired List after more than 30 years of honorable and devoted service on active and inactive duty. From the time of his release from active duty in 1946 until his retirement he was Consultant to the Surgeon General of the Navy and Consultant in Psychiatry to the Bureau of Medicine and Surgery.

\* \* \* \* \*

The previous two issues of the Medical News Letter contained an excellent monograph on leadership developed by the staff of a Naval Reserve Medical Company. The Leaders Code which follows concludes this series.

## THE LEADER'S CODE

**I** BECOME A LEADER BY WHAT I DO. I KNOW MY STRENGTH AND MY WEAKNESS AND I STRIVE CONSTANTLY FOR SELF IMPROVEMENT. I LIVE BY A MORAL CODE, WITH WHICH I SET AN EXAMPLE THAT OTHERS CAN EMULATE. I KNOW MY JOB AND I CARRY OUT THE SPIRIT AS WELL AS THE LETTER OF ORDERS I RECEIVE.

**I** TAKE THE INITIATIVE AND SEEK RESPONSIBILITIES, AND I FACE SITUATIONS WITH BOLDNESS AND CONFIDENCE. I ESTIMATE THE SITUATION AND MAKE MY OWN DECISION AS TO THE BEST COURSE OF ACTION. NO MATTER WHAT THE REQUIREMENTS, I STAY WITH THE JOB UNTIL THE JOB IS DONE; NO MATTER WHAT THE RESULTS, I ASSUME FULL RESPONSIBILITY.

**I** TRAIN MY MEN AS A TEAM AND LEAD THEM WITH TACT, WITH ENTHUSIASM, AND WITH JUSTICE. I COMMAND THEIR CONFIDENCE AND THEIR LOYALTY. THEY KNOW THAT I WOULD NOT CONSIGN TO THEM ANY DUTY THAT I MYSELF WOULD NOT PERFORM. I SEE THAT THEY UNDERSTAND THEIR ORDERS AND I FOLLOW THROUGH ENERGETICALLY TO INSURE THAT THEIR DUTIES ARE FULLY DISCHARGED. I KEEP MY MEN INFORMED AND MAKE THEIR WELFARE ONE OF MY PRIME CONCERNS. THESE THINGS I DO SELFLESSLY IN FULFILLMENT OF THE OBLIGATIONS OF LEADERSHIP AND FOR THE ACHIEVEMENT OF THE

UNIT GOAL. — "The Reserve Weaponeer," BuWeps Reserve Information Bulletin, March - April 1962.

Promotions  
(continued from page 37)

To Commander - Medical Service Corps

William A. Burgess  
Dorothy L. Chandler  
Francis R. Duchanois  
Henry T. Eigelsbach  
Leon J. Greenbaum  
Lawrence V. Hanks  
Mary E. Hawthorne  
Warren W. Sherwood

To Commander - Nurse Corps

Gwendolyn Dekle  
Georgia A. Dover  
Jeannette C. Hansen  
Evelyn L. S. Lee  
Edna M. Macewicz  
Leona M. Panther  
Frances B. Primerano  
Margaret A. Ross  
Marie A. Schanzmeyer  
Jessie E. Squire  
Helen G. Williams

\* \* \* \* \*

A lean compromise is better than a fat lawsuit.

—G. Herbert

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